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ABSTRACT

This paper describes what the medical scientist training program (MSTP) is, how a student decides whether to apply for the MSTP, practical questions to ponder in considering a dual degree career, MSTP training, National Institute of Health (NIH) and other funding opportunities, and M.D./Ph.D career paths. (KHR)

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THE MEDICAL SCIENTIST TRAINING PROGRAM: AN M.D/PH.D. TRAINING OPPORTUNITY*

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The Medical Scientist Training Program: An M.D/Ph.D. Training Opportunity

What is the Medical Scientist Training Program?

Generally, a combined MD/PhD degree is exactly what the name implies. That is a dual degree program of study to train individuals as physicians and scientists most commonly but not exclusively in biological sciences. Approximately 100 U.S. medical schools have some type of MD/PhD combined training with varying types of funding arrangements ranging from partial to complete subsidies for the student. The best established of the combined degree programs is the Medical Scientist Training Program.

The National Institute of General Medical Sciences (NIGMS) created the Medical Scientist Training Program (MSTP) in 1964 to support research training leading to the combined MD/PhD degree. Overall the MSTP seeks to fulfill a national need for individuals who will apply clinical and research expertise to solutions of the most pressing problems in medical science. Graduates of the program enter a variety of career paths. Most commonly they hold positions in academic medicine, in basic science departments. Or in research institutes such as the National

Institutes of Health. From its beginnings in 1964 with 3 funded programs (Chicago was among the earliest ones) it is now 33 programs involving 37 degree-granting institutions with a total of 828 trainees.

How Should A Student Decide Whether to Apply for the MSTP?

A good starting point is with what we call the paper credentials. The MSTP seeks intellectually gifted students with strong academic records and a commitment to and experience in biomedical investigation. A strong interest and potential in medical science and in basic research are important criteria for selection by MSTP admissions committees. Successful applicants generally have extensive experience in undergraduate research or independent study. Eligibility for the MSTP requires U.S. citizenship or permanent resident status. Aside from these paper credentials, the really strong MSTP applicants are:

Creative and imaginative
High energy - low maintenance individuals
Persevering
Resourceful and enterprising

They can flourish in ambiguity, have strongly moored egos, and possess something akin to intuitive ethical underpinnings. They cannot just *do* good science and medicine but *love* science and the healing arts. They love answers but the thrill is in the questions. They are life-long learners and could not vision otherwise.

Practical Questions to Ponder in Considering a Dual Degree Career

The first question we might ask is "Why do both?"

There are the long years of training and preparation. MSTP training is four year of medical school sandwiched by four or more years for the PhD. The best MSTP programs give a double dose of both with no short cuts. Clinical training as an intern and resident then very likely a research fellow follows this MD/PhD predoctoral training. All the while trying to carry on with life's other demands and decisions – finding and choosing a partner, starting a family, and fulfilling other family obligations. The typical MSTP may be in his or her early thirties before finishing training and "beginning" a career.

Some MDs with successful clinical practices have equally successful research careers in basic science that accomplish the same career ends by following up their medical training with first-rate research fellowship training. Other MDs have no clinical practice whatever and are rigorous basic science investigators.

A second important question a potential MSTP applicant might ask is "Can I handle the schizoid existence of the physician-scientist"? In all candor MD/PhD training is a schizoid existence. Make no mistake about it. It begins at the early onset of training and continues throughout one's career. There is often competition between the two disciplines. The MD and the PhD live in different cultures with entirely different training and different perspectives on problem solving. They speak different languages.

Question number three may be, "Can I realistically do both medicine and bench research and be equally successful at both"? The answer is a resounding yes for a selected few. Always it is important to keep in mind that the MD/PhD is not for everybody. We'll return later to the question, why do both?

MSTP Training

Most of the NIH-funded MST programs are similarly run. The general schema for MST programs is a 2+4+2 model. Training begins with the two basic science years of medical school followed by a 3-4 year leave of absence for the PhD, then returning to medical school to complete the 2 years of clinical training. There are variations but basically most programs follow that schema.

An important quality to look for after deciding that the MSTP is the life for you is to look for an institution that has an MD/PhD culture. The most successful MSTP programs are not independent discrete programs of MD and PhD training but offer an integrated MD/PhD course of study. At Chicago we tend to encourage a maximum of flexibility in directing our MSTP students, and trainees are encouraged to develop their own unique independent career pathways. Key ingredients to the success of our program are a careful admissions process and personalized mentoring, combined with a fertile environment conducive to interdisciplinary research in state of the art laboratory facilities. Chicago has a tradition of organizing interdisciplinary programs and facilities that encourage collaborative research and bi-directional activities creating an attractive environment where

MSTP trainees can thrive and prosper. We have a tight compact campus with clinical and laboratory facilities in close proximity of each other that gives us a natural habitat for the MSTP student. The MSTP student fit here in ways that do not happen at other places.

Chicago's MSTP is unique from all other NIH-funded programs in that it begins the MSTP student in the summer with students taking a special 10-week MSTP only courses in anatomy and histology. This is an intense educational experience that has the obvious academic objective to teach the students anatomy and histology but is also the beginning of a bonding experience that works to crystallize the developing esprit de corps and which lasts during their entire tenure at the university.

MSTP trainees join their cohort of medical students in the fall and begin their lives as dual citizens juggling the conflicting demands of the medical student and graduate student. The summer benefit kicks in during the fall quarter with the opening up of lots of free time in their curriculum to take graduate courses.

In the summer between their first and second years of medical school, MSTP trainees participate in an intense full time research experience, typically completing two laboratory rotations.

In summary, during the first two years of their training, Chicago MSTPs complete the first and second year of medical school, a minimum of two full-time research laboratory rotations, fulfill graduate course requirements including standing for the preliminary qualifying examination.

They then take a leave of absence from medical school to undertake the PhD. Following completion of the PhD they return to medical school for the third and fourth of clinical training.

NIH and Other Funding Opportunities

There are differing levels of support among programs but generally students in the MSTP receive full tuition support, insurance and health fees, and a stipend to cover living expenses. At Chicago students are supported throughout their MD and PhD training so long as they remain students in good standing. Up to six years of support are provided by the MSTP training grant from the National Institute of General Medical Sciences. Additional years of graduate training are supported through research funds available to trainee advisors or other sources. This academic year, our MSTP students receive $19,000 in stipend, Currently $15,060 comes from the NIH training grant the remainder supplemented by the University.

Altogether the support is a package of some $54,000 this year. That represents a substantial institutional investment and one might think a major incentive to students to an MST program. Most students would not willingly endure the rigors of the MSTP training simply for a subsidized medical education. In fact the federal government dropped its payback provision several years ago because the tremendous paperwork did not warrant the few students who defaulted on their commitment. Overall we have an academic attrition rate of less than one percent.

MD/PhD Career Paths

A 1998 NIGMS study documented that the NIH MSTP has been successful in training academic physicians in the United States for the past 37 years. The University of Chicago MSTP as has been at the forefront of this effort. One hundred sixty five individuals have completed our program. Today more than 80% of our graduates hold academic or research appointments or are continuing on course with their research and clinical training. Among the Chicago graduates, at the latest count 11 are professors, 24 are at the associate professor level, 32 are assistant professors, five are instructors, 11 are medical directors, eight are in national

laboratories and 64 are still in training as fellows and residents. Only nine are in private practice and one is inactive. Collectively these individuals have published well in excess of 1,000 scientific papers.

We return to the question posed earlier, why do both"? The main reason for doing both lies in the promise that medicine holds to transform our lives for the better in ways never dreamt. We have seen the dawning of the golden age of biology at a time when the therapeutic applications of our astonishing discoveries appear to be around the corner. Recent scientific and medical breakthroughs have made medical advances mainstream news. Molecular biology and genetic research open up whole new vistas of scientific discovery that will pave the way to new diagnoses, preventions, and therapies.

Francis Collins, director of the National Human Genome Research Institute, National Institutes of Health, in recent remarks to an NIH gathering on the Ethical, Legal, and Social Implications of the Human Genome Project offered these thoughts to ponder.

The concept of race is purely a social construct. Scientific discovery documents what we have long known. That is that most people would say that they know race when they see it but are

confused when asked to define it. We are all part of an extended historical family and separation by race is scientifically unjustifiable.

We now know to a scientific certainty that as humans we share 99.9% of the genome sequence and our similarities are vastly greater than our differences. Our genetic variations come in the 0.1% of unshared DNA.

He set forth a laundry list of possible ethical, legal and social implications of research issues. I've listed just a few of them:

2000

- Potential uses of genetic technology for enhancement of the human condition
- Non-medical consequences of the study of human variation and how will that affect
  - ✓ behavioral genetics
  - ✓ concepts of race and ethnicity.

2010

- Predictive genetic tests available for a dozen conditions
- Many primary care providers begin to practice genetic medicine
- Reasonably effective federal legislative solutions to genetic discrimination and privacy in place in the U.S.

2020

- Gene-based designer drugs for diabetes, hypertension, etc. coming on the market
- Cancer therapy is precisely targeted to the molecular fingerprint of the tumor
- Mental illness diagnosis transformed, new therapies under study, societal views shifting.

2030

- Comprehensive genomic-based health care is the norm
- Average life span reaches 90 years
- Serious debate is underway about humans possibly "taking charge" of their own evolution

The true promise of medicine will come to fruition in the next few decades.

Who will be our physician-scientists for the 21st century? We need a few gifted individuals who are properly trained to comprehend the scientific basis of medicine and apply this knowledge to the bedside practice of medicine as a scientific discipline. By definition minorities should be represented proportionally. The federal government is addressing this challenge by designing programs to increase the number of minorities training for careers in biomedical research. One hope is that these well-trained individuals can address the growing medical

disparities that disproportionately affect minorities and medically underserved populations in this country. The MSTP is one avenue that promises to fulfill this hope.

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